

# Operating Instructions For The XSD-8/96 Screw Cap Tube De-Capper / Capper

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## 1 IMPORTANT SAFETY INFORMATION

Read through this service manual and the safety instructions carefully and consider dangers and the prevention of accidents when operating the machine.

- The machine must only be operated when the service manual has been read carefully.
- The machine must be screened off appropriately before operation.
- The machine must only be used to "De-Cap" and "Re-Cap" micro tubes in specific rack types.
- The machine settings must not be changed.

### **Manufactured by:**

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## **2 Machine description and operation**

The present unit, hereafter termed as "XSD" is designed to De-Cap and Re-Cap a full 96 tube rack with screw caps (screw caps are hereafter termed as Caps) on close set tubes in specific rack types.

The machine is configured by default at the factory for use with specific tube and rack types and this machine description applies to different versions that are programmed to different tube and rack manufacturers.

It can be manually controlled or by using a robot cell.

### **Mode of operation:**

The rack with tubes is loaded into the front of the rack container. The store rack for decapped Caps is loaded into the back of the rack container. The machine functions are manually activated via the control panel or via robot integration from PC via command set.

8 "bits" are moved vertically and automatically into a range of "Caps", then a full range of 8 tubes is decapped – i.e. Caps are screwed counter-clockwise synchronous with an upward return on the 8 bits.

The 8 Caps are moved to rack for Caps. This sequence continues for all 12 ranges until the whole tube rack has been decapped. Alternatively, decapping to waste.

A sensor checks that all Caps are decapped, then the rack container will move away from the machine and back to its initial position. If a Cap is not Decapped, the machine will automatically try to De-cap again. This will happen 3 times after which the machine will report an error.

When the rack container is in its initial position it will be away from the machine and the robotic gripper or other equipment will have free access to remove the rack for further operation in the system. While further operation takes place the rack with decapped Caps can remain in the machine or be removed for subsequent recapping or they can be recapped with new Caps.

Recapping takes place in reverse order. The 8 bits take a range of Caps from the Cap rack. The tube rack is recapped range by range, range 12 – 1. An integrated function ensures that all Caps are equally tightened with a defined torque.

A sensor controls that all Caps are Capped, then the rack container will move away from the machine and returns to its initial position.

The full process is controlled by an integrated PLC that is pre-programmed by the factory.

### 3 Limitations on machine use

XSD is only designed for the above-mentioned purpose. Any other use is considered improper.



### 4 Specifications

- ❑ Noise level, energy equivalent: < 70 dB(A)
- ❑ Supply voltage EC: 220-240 VAC 1/N/PE – 5.0 A
- ❑ Supply voltage US: 100-120 VAC 1/N/PE - 5.0 A  
Use IEC 320 plugs only. Ground must be connected at all times
- ❑ Fuse 2 pcs.: 250 V, 5A (5x20 mm)  
Use IEC 60127 fuse only
- ❑ Communication: RS232 – Windows Hyper Terminal

The machine must only be operated under the following conditions:

- ❑ Indoor
- ❑ At temperatures between 5°C and 40°C
- ❑ Max. 80% relative humidity up to 31°C, linear decrease to 50% relative humidity at 40°C.

The following symbols are used on the machine:

	This symbol is placed on the side of the machine close to the net plug and implies the risk of electric shock on the opposite side of the machine cover.
	This symbol is placed on the table top and implies the danger of jamming fingers near the tower or rack container.

## **5 Installation instructions**

### **Installation**

By default the machine is equipped with T-slots in the base plate that fits the deck of various pipettes – among others Tecan freedom evo. If the T-slot is not used the machine must be placed at an even and stable base (table etc.). For increased security with robot control the machine can be fixed at the table top with fittings that can be ordered separately.

The enclosed net plug is connected to an earthed 230V/115V outlet. The socket **MUST** be switched to "0" before it is connected. Failure to do so may damage the electric circuit.

The enclosed RS232 socket (female/male) is connected to the machine for robot communication with PLC. This plug is also used for general service of PLC. List of applicable ASCII codes are found in the end of this documentation.

### **Noise level reduction**

The machine does not emit noise during operation, therefore no other measures in terms of noise level reduction apply.

### **General**

Avoid that moving parts are subject to pressure and weight e.g. do not rest a hand on the rack container or twist the container as it may pull the machine out of position or at worst damage moving parts.



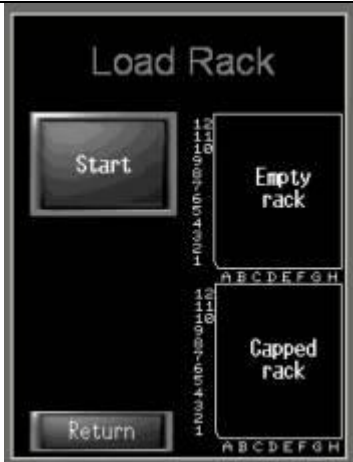
## 6 Instructions for use

### 6.1 Manual operation

#### 6.1.1 Starting procedure

	<p>Plug in the machine with a net cable (230VAC EC or 110VAC US)</p> <p>Switch on the machine</p>
	<p>"initialization" icon blinking and await automatically initialization process – approx. 2 minutes</p> <p>Machine is ready for use when the initialization button stops blinking</p>
	<p>Select tube size: 0.5 ml. or 1.0 ml.</p> <p><b>NB.: Applies not on all machines programmed.</b></p>

### 6.1.2 Decap and store

	<p>Press "Decap and Store" icon</p>
	<p>Load rack with tubes to be Decapped in front position of the container.</p> <p>Load an empty rack for temporary storing of "Caps" in the hind position of the container.</p> <p>Note: If the machine is programmed to Matrix tubes a specific rack for Caps must be used.</p> <p><b><i>Item no.: 165-11-12</i></b></p>
	<p>Press "Start" icon</p> <p>Decapping process starts and runs approx. 2 minutes.</p>







When decapping is complete the container returns to its initial position


Rack container and rack for Caps can be removed from the machine.

### 6.1.3 Recap


	<p>For recapping press:</p> <p><b>Press "Recap from store"</b></p>
	<p>Load rack</p> <p>Rack with tubes without Caps are loaded into the front position of the rack container</p> <p>Rack med Caps are loaded into the hind position of the rack container.</p>
	<p>Press "Start" icon</p> <p>Recapping process starts and runs approx. 2 minutes.</p> <p>When decapping is complete the container returns to its initial position</p> <p>Rack with Caps and empty rack for Caps can be removed from the machine.</p>


6.1.4 "Waste" function

	Press "Waste" icon
	Load rack with tubes to be Decapped and Caps to be "Wasted"
	Press "Start" icon

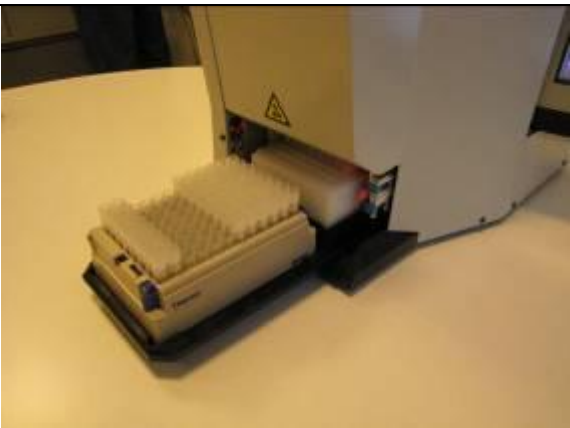

	<p>Recapping process starts and Caps will be sent to "Waste" channel and fall out of the machine</p> <p>The process runs approx. 2 minutes.</p>
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### 6.1.5 Safety function – Only on stand alone units

	<p>If fingers or foreign objects accidentally come in contact with the machine during operation the safety system will be activated and the machine will stop.</p> <p>Then machine must be re-loaded</p> <p><b>NB.: Applies not on all machines programmed</b></p>
	<p>Press "Go To Waste" icon</p> <p>Caps will be rejected and falls out through the "Waste" channel.</p>

	<p>The electricity for the machine is shut off for approx. 30 sec.</p> <p>The machine must be re-initialized – see starting procedure. - 6.1.1</p>
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### 6.1.6 Automatic surveillance of errors

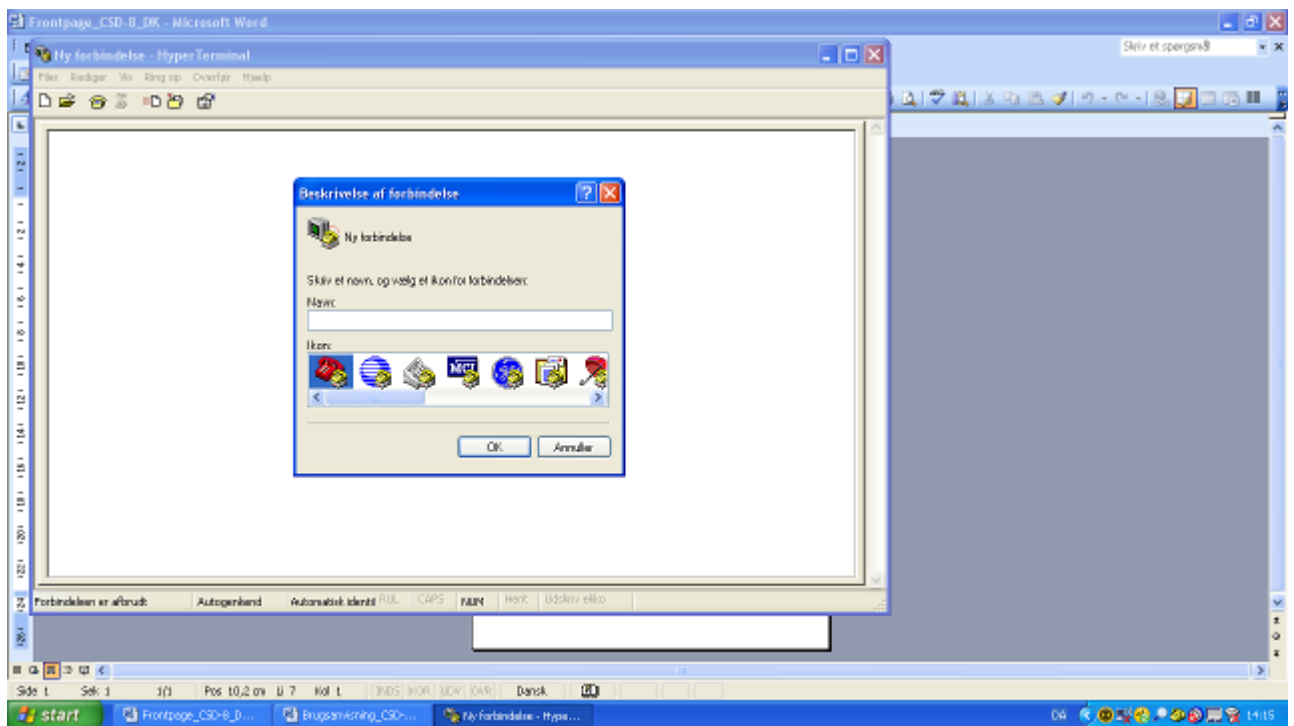
	<p>All tubes, Caps, tolerances etc. are different. Caps can be dropped or placed incorrectly in rack Caps</p> <p>The machine automatically controls re-and decapping and assure correct loading of Caps in racks.</p>
	<p>In case of unintended errors during operation, the machine will automatically rectify. If the machine fails to do so it will automatically stop and return to its initial position. Then the error can be rectified manually.</p> <p>When the error is rectified – press "start" and the process will continue.</p>

## 7 Automatic operation (Integration)

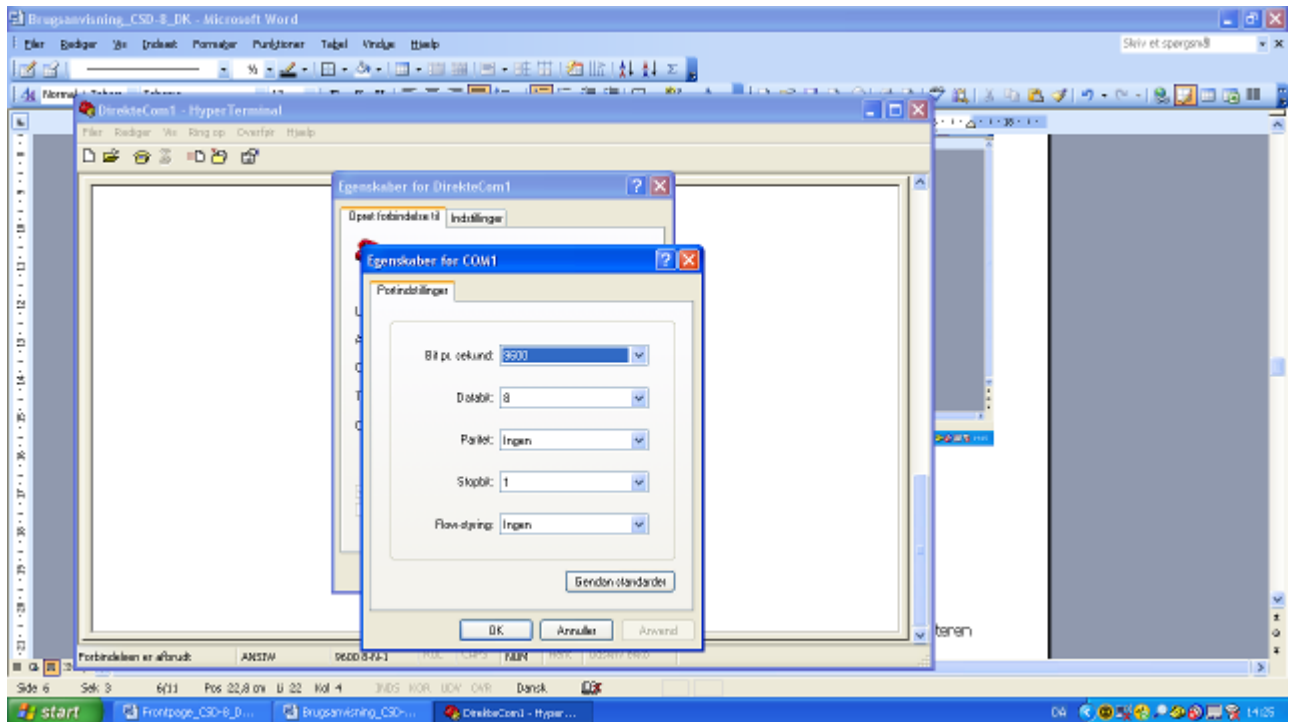
### 7.1 Before use

Normally, when the machine runs in automatic mode it will be integrated and controlled by the scheduler software from the integration unit. For example this can be a Tecan pipettor where Tecan EvoWare will be the controlling unit by means of a driver that can communicate with the machine via "List of commands". Please contact Cedrex or the integration unit for further information.

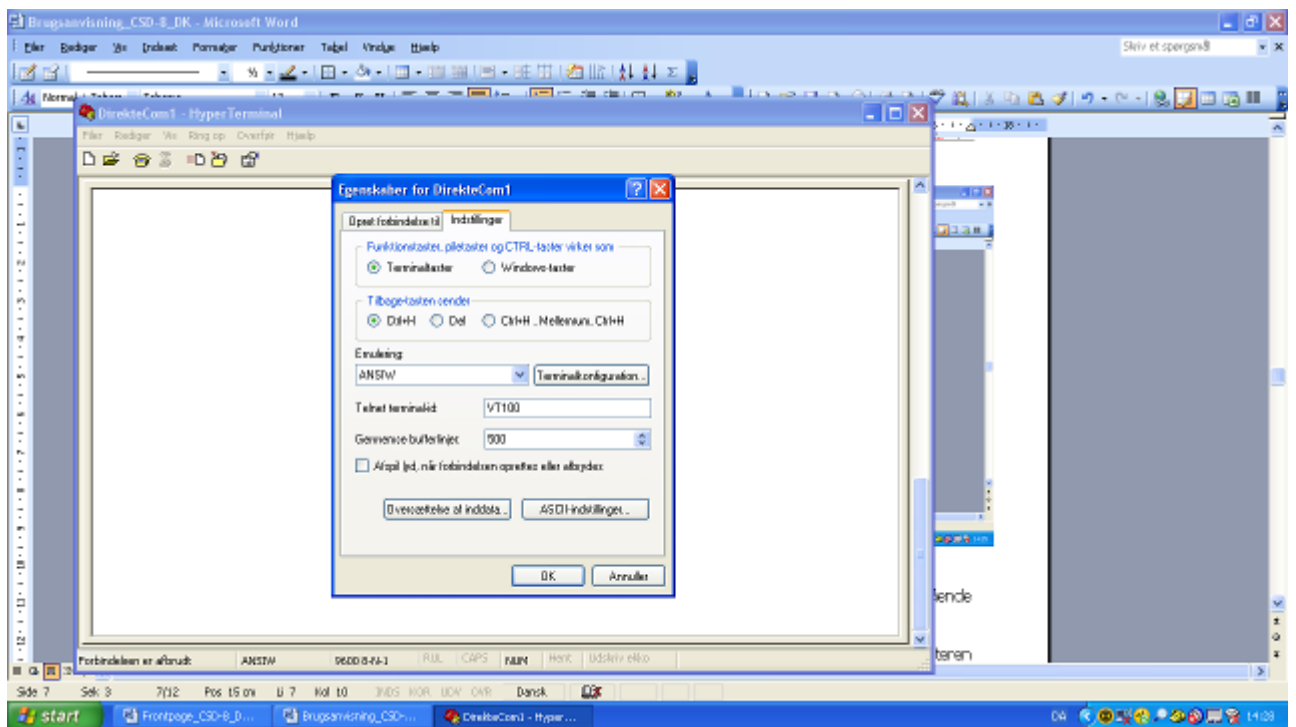
1. It is possible to test the machine commands via "Hyper Terminal" in Windows.
2. Start Windows Hyper Terminal: Programs/ Accessories/Communications



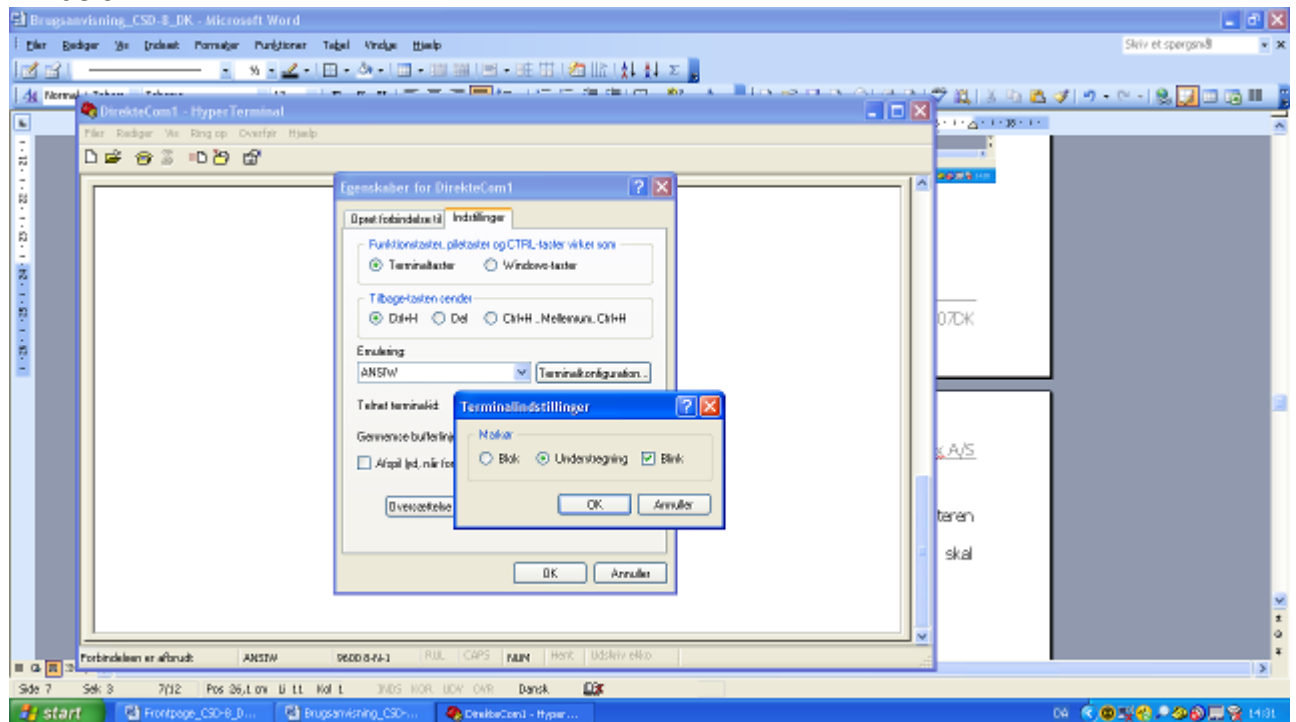
3. Type the name of your connection. E.g. XSD-96 under "new connection"
4. Establish new connection via e.g. COM1
5. Bits per second: Type 9600
6. Data bits: 8
7. Parity: None
8. Stop bits: 1
9. Flow control: None



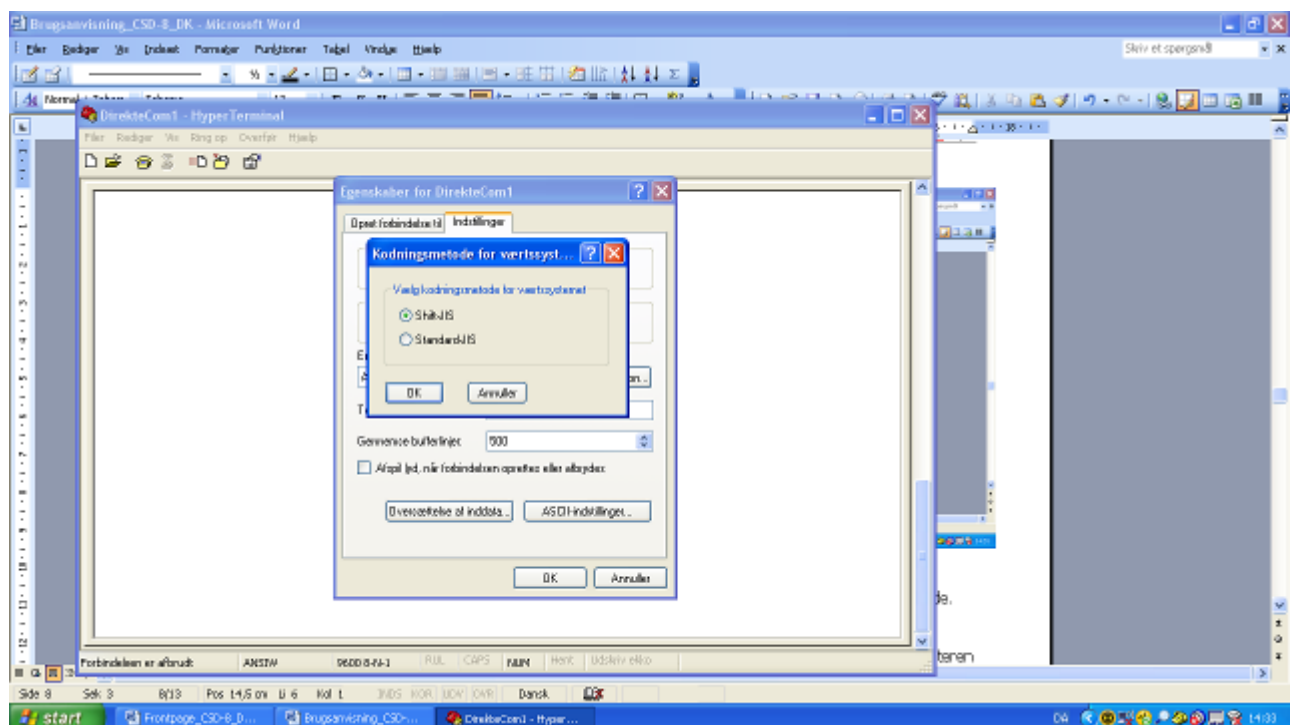
10. Click OK, then go to Settings and fill out the relevant data fields as shown below



11. Open Terminal Services Configuration and fill out the relevant fields as shown below

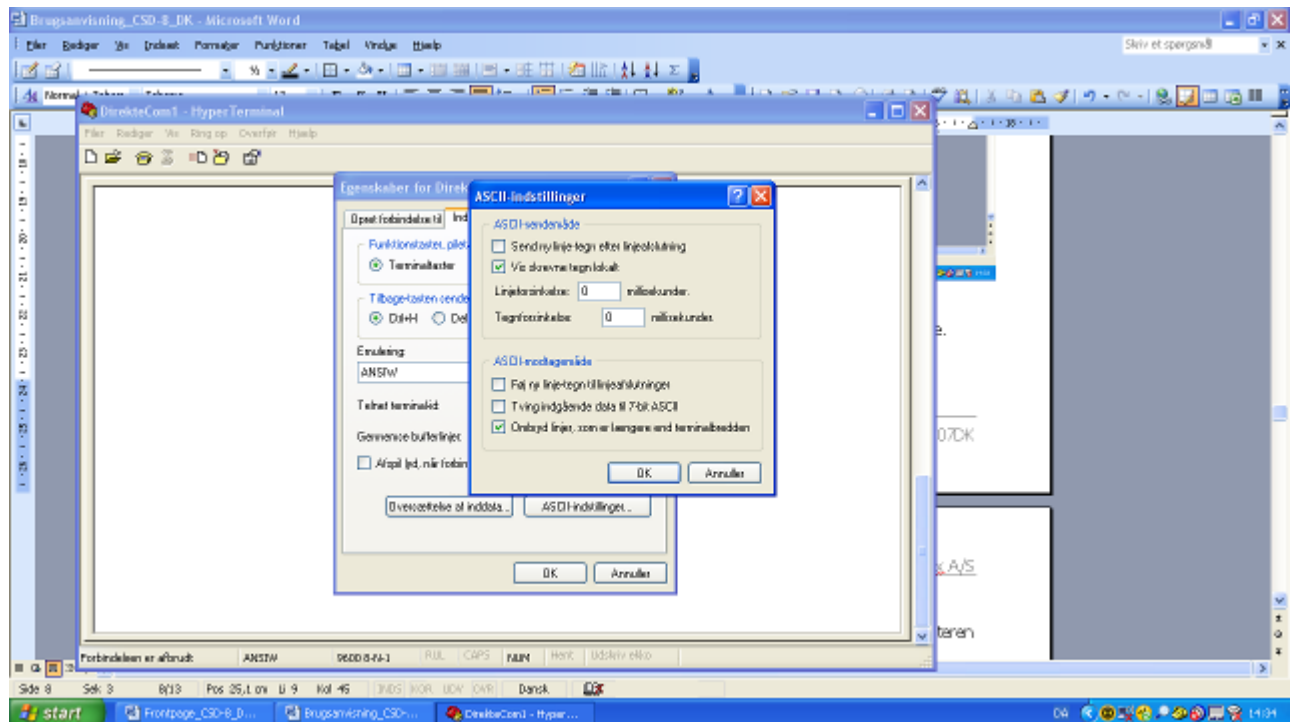


12. Click OK, then open "Translate data" and fill out the data fields as shown below





13. Click OK, then open "ASCII settings" and fill out the data fields as shown below



14. Hyper Terminal is now installed on the machine.

## ***7.2 Start Up***

1. Before the machine is started, the container must be pulled out approximately 1 cm. This is to ensure that the container does not activate the back end stop of the machine during an initialization process.
2. Switch on the main switch of the machine.
3. The Hyper Terminal window displays an "OK" and the machine is now ready for use.
4. By using the command list it is possible to type in all functions of the machine via the Hyper Terminal.
5. E.g. try to type in A (remember to use upper case letters). The machine will Decap the top range. Then try to type in M and the machine will Recap the range again. By using the same line of commands it is possible to activate all machine functions. (Note that the machine will "shake" the rack container, this is to ensure that all tubes fall to the bottom of the rack).
6. In practice, Hyper Terminal will not be used to activate the machine. Instead another program e.g. Tecan EVOware will be used to transmit the "script commands".

## ***7.3 During operation***

1. No measures are needed during normal operation.
2. The machine only runs when a command is given.

## ***7.4 Errors and repair manual***

1. Errors can occur if e.g. the machine axes have been blocked, if a cap is stuck or if the container has been pushed. This will lead to position errors of the machine engines.
2. Normally, it is only possible to repair errors by pulling the main switch and restart the machine, then it will automatically reset itself.

## ***7.5 Settings***

During operation, it is usually not necessary to change any settings other than the above-mentioned as the machine has been set to an optimal configuration at the factory. Specific insight is required in order to change the machine settings and therefore one should always contact the machine supplier.

## 7.6 Command list

Version 3.2

### COM Settings:

Baudrate: 9600  
 Databit: 8  
 Parity: none  
 Stop Bit 1  
 Handshake: OFF

From PC to PLC	Answer
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	Decimal (PLC)	ASCII (PC)	Com Succes	Com Failed
Decap Col 1	65	A	DecapOK	DecapError
Decap Col 2	66	B	DecapOK	DecapError
Decap Col 3	67	C	DecapOK	DecapError
Decap Col 4	68	D	DecapOK	DecapError
Decap Col 5	69	E	DecapOK	DecapError
Decap Col 6	70	F	DecapOK	DecapError
Decap Col 7	71	G	DecapOK	DecapError
Decap Col 8	72	H	DecapOK	DecapError
Decap Col 9	73	I	DecapOK	DecapError
Decap Col 10	74	J	DecapOK	DecapError
Decap Col 11	75	K	DecapOK	DecapError
Decap Col 12	76	L	DecapOK	DecapError
Cap Col 1	77	M	CapOK	CapError
Cap Col 2	78	N	CapOK	CapError
Cap Col 3	79	O	CapOK	CapError
Cap Col 4	80	P	CapOK	CapError
Cap Col 5	81	Q	CapOK	CapError
Cap Col 6	82	R	CapOK	CapError
Cap Col 7	83	S	CapOK	CapError
Cap Col 8	84	T	CapOK	CapError
Cap Col 9	85	U	CapOK	CapError
Cap Col 10	86	V	CapOK	CapError
Cap Col 11	87	W	CapOK	CapError
Cap Col 12	88	X	CapOK	CapError
RESET FLAG	89	Y	OK	ResetERROR
INITIALIZE	90	Z	OK	HomeERROR
STATUS	97	a	StatusOK	StatusError
WasteAll	98	b	WasteAllOK	WasteAllError

<b>StoreAll</b>	<b>99</b>	<b>c</b>	<b>StoreAllOK</b>	<b>StoreAllError</b>
<b>RestoreAll</b>	<b>100</b>	<b>d</b>	<b>RestoreAllOK</b>	<b>RestoreAllError</b>
<b>1.0ml</b>	<b>102</b>	<b>f</b>	<b>1.0ml</b>	<b>Option</b>
<b>0.5ml</b>	<b>103</b>	<b>g</b>	<b>0.5ml</b>	<b>Option</b>
<b>reset 1.0ml/0.5ml</b>	<b>101</b>	<b>e</b>		<b>Option</b>

### Notes:

After power on, the decapper does automatically home all positions:

Then it does immediately a input check (sensor check) and sends

The decapper has a internal command timeout with 60seconds:

<b>OK</b>	<b>Error</b>
<b>StatusOK</b>	<b>StatusError</b>
	<b>TimeOutError</b>

After sending a command (e.g. "A") there will be no response until the action is done (20-30secs)

No polling is possible during that time (e.g. checking the status for busy/decapping/capping etc.)

Baudrate on decapper side is at the moment not faster then 9600, maybe more later

### Actual Timings

Decap	30sec
Cap	30sec
Reset	70sec
Home All	70sec
Status	<1sec
WasteAll	140 sec
StoreAll	140 sec
RestoreAll	130 sec

## **8 Instructions for maintenance**

Normally, it is not possible for the operator to maintain the machine. It is advisable to maintain the machine every 50 hours of operation and minimum once yearly. (100 hours of operation corresponds to approximately 500 racks).

Check whether the machine has damages and make sure to repair these before operation.

### **Service**

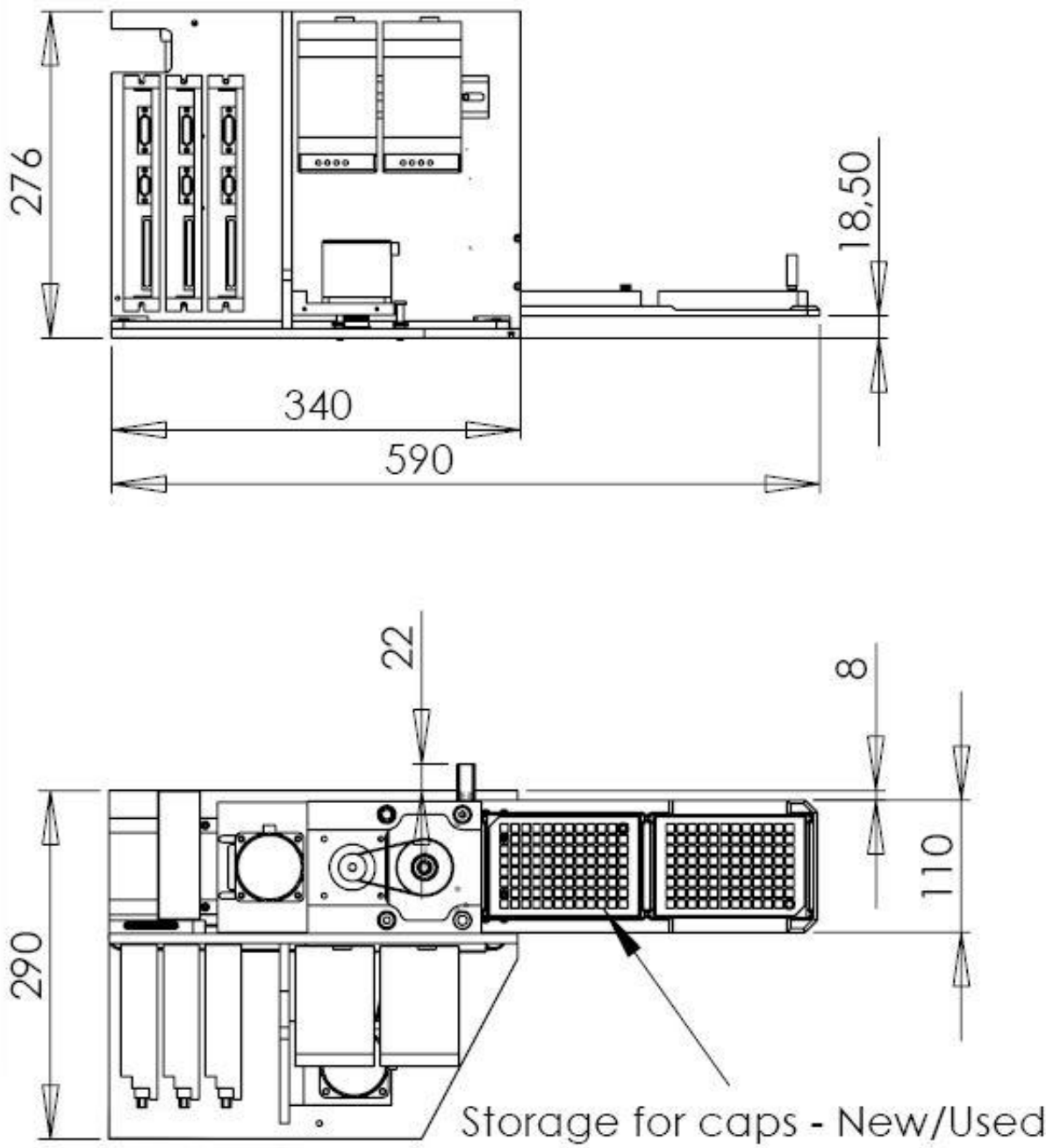
The moving mechanical parts and components do not require additional lubrication and the machine requires no maintenance other than cleaning.

However, non-acid oil (sewing machine oil) can be used on the moving parts to reduce friction.

### **Repair**

If the machine needs repairing, please contact the supplier.

9 Scale drawing



## 10 WEEE statement (European Union)



The symbol above indicates that Waste Electrical and Electronic Equipment (WEEE) is not to be disposed of as unsorted municipal waste. Equipment marked with this symbol is to be collected separately.

The objectives of this program are to preserve, protect and improve the quality of the environment, protect human health and utilize natural resources prudently and rationally. Specific treatment of WEEE is indispensable in order to avoid the dispersion of pollutants into the recycled material or waste stream. Such treatment is the most effective means of protecting the customer's environment.

The waste collection, reuse, recycling, and recovery programs available to Cedrex-customers, vary by customer location. Please contact the responsible body (e.g., your laboratory manager) for information about local requirements.

## 11 EC Declaration of Conformity

We  
Cedrex A/S  
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DK-2690 Karlslunde  
Phone +45 32 57 51 81

Hereby declares that the product, cited below,

Screw Decapper/Recapper  
Type: XSD – 8/96  
Serial number: 164-01-001 til 164-01-999

Machine to "De-cap" and "Re-cap" Caps on Micro tubes in racks

Conforms to the requirements of the EC Declaration of Conformity for Machines (Directive 98/37/EC) of 22 June 1998.

Conforms to other relevant EC Directives:

Low Voltage Directive (LVD) – Directive 73/23/EEC

EMC Directive 89/336/EEC

Karlslunde, 10 Oktober 2008



Stig Christensen,  
**Mechanical Engineer**